Rec'd 50,000 - 3-11-70
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FACT SHEET

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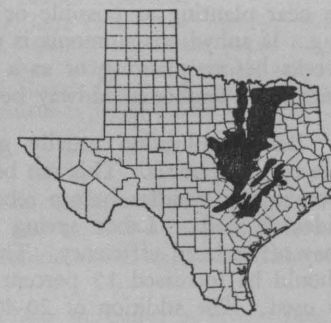
KEYS TO PROFITABLE GRAIN SORGHUM PRODUCTION IN THE BLACKLAND PRAIRIE AND THE GRAND PRAIRIE



Grain sorghum is grown annually on some one million acres that represent about 80 percent of the feed-grain acreage in the Blackland Prairie and Grand Prairie. Average annual rainfall ranges from 30-45 inches, but its erratic distribution often makes grain sorghum production more reliable than corn production. This, along with easier establishment of proper stands and easier completion of harvest, results in grain sorghum being preferred to corn by most growers when market price is not a significant influence.

Cropping Sequence

Crop rotation to avoid growing the same crop on a field in succeeding years will help reduce diseases, insects and weeds, but suitable systems vary among individual farms. Grain sorghum residue helps maintain proper soil physical condition. Rotation of 1 or 2 years grain sorghum and 1 year of cotton are favored in much of the area. Three-year rotation of grain sorghum-cotton-small grain permits johnsongrass eradication during the fallow period following small grain harvest and soil moisture storage plus advantages where livestock is available. Farm program regulations may offer opportunities to grow soil-improving crops on diverted acreage. One such rotation could be oats-Hubam or Madrid sweetclover for 1 or 2 years, then grain sorghum and cotton next. Plow Hubam or fall-planted Madrid under each year as soon as blooming starts to avoid a weed problem with volunteer clover. Spring-planted Madrid produces no seed the first year.

Keep records on crop location because chemical residues may require changes in the system when chemicals have been used.

Seedbed Preparation

Begin seedbed preparation after harvesting the previous crop to allow more time to control weeds, store soil moisture, decay crop residue, apply fertilizer and firm the soil.

Such preparations include: (1) shred stalks of a previous row crop promptly; (2) chisel, disk, plow or bed to stop crop and weed growth and to mix the plant residue in the soil; (3) bed land by early fall and complete rebedding 6-8 weeks before normal planting date; and (4) control winter weeds with chemicals by row disk or rotary hoe to avoid disturbing the seedbed.

Fertilization

A balanced fertilizer program is essential for optimum yield, efficient use of water and growth to maturity in a normal time. The wide range of soils, rainfall and management practices requires tailoring fertilizer applications to each field. The best guide is a soil test recommendation from a reliable laboratory that has correlated the level of available soil nutrients and other factors influencing yield response. Send the laboratory a representative soil sample plus a description of soil conditions, past fertilization and future cropping including an estimate of expected yield.

If a soil test is not available, some general considerations on needs at 3,500 to 5,500-pound yield levels include:

Nutrient	Pounds per acre
Nitrogen (N)	40 to 100
Phosphorus (P_2O_5)	30 to 60
Potassium (K_2O)	0 to 40

If much undecayed crop residue remains at planting time, increase the nitrogen by 15 pounds for each estimated ton of dry residue per acre.

Fertilizer nutrients are generally used most efficiently when applied near planting time. However, it may be easier and cheaper to fertilize in the late fall before rebedding or in early winter in the sides of beds with chisel or sweep applicators. Allow ample time for seedbed to settle before planting. Use placement methods that avoid disturbing the seedbed. Phosphorus and potassium may be applied at any time prior to or

Prepared by Texas Agricultural Extension Service specialists headquartered at College Station, Stephenville and Denton, with supporting contributions by certain county agricultural agents; and by Texas A&M University Agricultural Experiment Station research staff at College Station, McGregor, Temple and Denton.

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at planting; however, some loss of nitrogen may occur if it is applied too early. To reduce application costs, these nutrients are usually applied at the same time and should be added just prior to rebedding or later. If soils are extremely dry or are likely to be covered with water for extended periods, nitrogen should be applied as near planting as possible or sidedressed after planting. If anhydrous ammonia is used, apply it 2 or more weeks before planting or as a sidedressing. Sidedress anhydrous ammonia midway between the rows.

Band application usually gives the most efficient use of phosphorus. This can be done by chisel application in the middles before rebedding or later into the sides of beds. Labor saving with bulk broadcasting may offset band efficiency. The amount of phosphorus should be increased 15 percent if broadcast application is used. The addition of 20-40 pounds of phosphorus per acre with the seed may improve early growth of seedlings and help get the crop off to a good start during a cool season especially on soils extremely low in phosphorus. Do not apply nitrogen or potassium with the seed. If sidedressing is needed, apply near the side roots (do not prune roots) within 3-5 weeks after emergence.

Zinc and iron deficiencies occur on a few soils. Iron deficient areas may need two to three foliage sprays of iron sulfate solution at 10 to 14-day intervals. Soil applications of zinc sulfate or chelate can be used.

Seed

Because seed is a low production cost item, purchase only those of best adapted hybrids with proven high germination, vigorous seedling growth and minimum number of off-types. Seed produced by reliable seedsmen and properly treated with a fungicide and an insecticide is the best assurance of meeting these requirements.

Select a hybrid based on previous performance under local or similar conditions. Ask your county agent about hybrids grown in local trials and in Texas Agricultural Experiment Station tests. Yields, standability, tolerance to important diseases in the area and maturity requirements should be considered. Although later maturing hybrids have the potential for higher yields under good moisture conditions and normal planting dates, medium maturing hybrids give the best yields most consistently over a period of years. This occurs because of the erratic rainfall distribution and especially where planting is delayed or moisture is short at planting.

Planting

Plant near the average frost date when a warming trend is forecast and when the soil temperature at about 7 a.m. is at least 55° F. This ranges from March 1 to April 5 in the central and southern counties, and March 10 to April 10 in the northern counties.

Plant about 1½ inches deep in moist soil. On medium to fine-textured soils, when possible, firm the drill row by rolling lightly to conserve moisture and insure germination. Higher yields may be produced with row widths averaging 30 inches or less if weed control and other cultural practices can be performed properly. Use 1 pound of average size seed for each 700 pounds of expected yield per acre, regardless of row spacing. Because seed size varies, adjust planters to obtain a seeding rate similar to the amount suggested.

Example: For 38 to 40-inch width rows and seeding rates equal to 4, 6 or 8 pounds per acre, plant 4, 6 or 8 seeds per foot of drill, respectively. For two rows per bed and 18-inch width rows, plant one-half as many seeds per foot of drill.

Irrigation

High-yield grain sorghum uses 20-22 inches of water during the growing season. This may be supplied from moisture stored in the root zone before planting and from seasonal rainfall. Some producers with bottomlands in this area can use irrigation to maintain ample moisture. Roots of mature sorghum plants can penetrate 4-6 feet deep, permeable soil, but they may be shallower in less favorable conditions. Adequate moisture is necessary during the critical growth stages of boot, bloom and soft dough.

Preplanting irrigation may be used if rainfall has not filled the root zone. When enough surface moisture is present for good germination, water for early growth may be applied after emergence. During the growing season, apply water when from 50-60 percent of the available moisture in the root zone has been used. With limited water supplies, irrigate for ample moisture during the early boot to soft dough stages. Additional water for leaching may be needed with each irrigation when using poor quality water. Rainfall, soil texture, depth of roots, weather and water quality will determine the number of irrigations, the interval between them and the amount per irrigation. Lighter, more frequent irrigations are required on sandy soils and on shallow soils.

Figure 1 shows the daily use of water by grain sorghum. Daily use begins to increase at the seven-leaf stage, and may be 0.30 inch per day during the boot to grain formation stages.

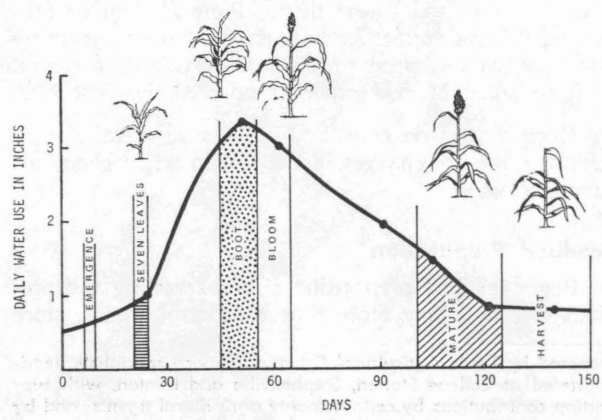

Fig. 1. Daily water use from planting to maturity.

Weed Control

Grass and broad-leaved weeds reduce yields and may interfere with harvesting. Satisfactory control is possible by proper seedbed preparation, timely shallow cultivation, crop rotation and tillage after small grain. Herbicides may be required to control certain weeds, or when rainfall prevents prompt tillage. In selecting herbicides, consider (a) label clearances, (b) effectiveness on specific weeds, (c) soil texture, (d) effect on sorghum, nearby crops and succeeding crops and (e) cost. General topics on herbicides follow.

Application before Planting

Johnsongrass. After previous crop, broadcast or spot spray with Dalapon when johnsongrass is 8-12 inches tall. If applied near planting, row disk beds 3 days later and wait at least 18 days to plant.

Annual broad-leaved winter weeds. Apply 2,4-D type herbicides when weeds are small and at least 3 weeks before planting.

Application at Planting

Annual broad-leaved and *grass weeds.* Herban, Milogard or combinations of Milogard with Herban or Lorox can be used. Combinations may give better control of large-seeded grasses. Large seeded, broad-leaved weeds are not effectively controlled. Do not use on sands or loamy sands. Band applications are cheaper and may leave less residue than if broadcast. Fall crops can follow Herban, but not Milogard. See B-1029 concerning spring crops.

Application after Planting

Broad-leaved weeds and *some small-seeded grasses.* AAtrex, with a surfactant or a nontoxic oil added, can be used 3 weeks after sorghum emergence to control small (2-inch) weeds except on sand or loamy sand soils. Residue limits next crop to sorghum or corn.

Broad-leaved and *grass weeds.* Karmex with a surfactant as directed spray to small weeds after the crop is 15 inches tall can be applied regardless of soil texture.

Broad-leaved weeds. Use 2,4-D after the crop is 6 inches tall and before flowering. Use salt formulations with a low vapor hazard, use precautions against spray drift and comply with restrictions in regulated counties. Banvel can be used during 10-25 days after sorghum emergence. At recommended rates, it is less hazardous than 2,4-D to nearby crops.

Insects

Description of the more common insects that may attack grain sorghum in this area and some principles of control follow.

Southwestern corn borer larvae feed within crown and stalk, causing stunting, lodging and yield loss. Plant early to avoid late-season buildups. Apply insecticides when 25 percent of plants show injury. Shred and plow under stalks promptly after harvest.

Corn earworms and *sorghum webworms* feed on developing and maturing grain. Because corn earworm is cannibalistic, insecticides often are not needed. Plant early to avoid late-season buildups. Check plants frequently after heading. Apply insecticides when necessary.

Fall armyworm larvae feed on seedlings and in the whorl during preboot stage, causing leaf ragging and "buck shoting." Apply insecticides when stand or bud damage is threatened.

Aphids suck plant juices. Severity of damage depends upon plant size, kind and number of aphids, parasites and predators. The yellow sugarcane aphid and greenbug may cause losses from the seedling through grain formation stages. The corn leaf aphid sometimes cause seedling loss. Use Extension publications for detection and control information.

Sorghum midge adults deposit eggs in florets at bloomingtime. Larvae consume developing seeds, resulting in "blasted" heads. Plant early to avoid late-season buildups. If midge are present and damage is expected, begin insecticide applications when about 50 percent of heads first begin blooming.

Soil insects (seed-corn maggot, corn rootworms, wireworms, cutworms) in larval stages feed on seeds, seedlings, roots and stems of sorghum. Preplant soil application is the most effective control, but seed furrow treatment often is satisfactory. Treatments on seedlings may control cutworms.

Other insects (chinch bug, false chinch bug, stinkbug, flea beetle) occur in local areas. Chinch bugs suck juices from young plants. Flea beetles chew holes in leaves. Stinkbugs and false chinch bugs suck juices from developing grains. Apply insecticides when populations reach damaging levels.

Diseases

Description of the more common diseases that damage sorghum in this area and control principles follow. For best results, use a combination of suggested control practices.

Seed rots and *seedling disease* are caused by several fungi and bacteria. The recommended seed treatment fungicides used by seedsmen usually give protection, but keep crop residue out of seeding zone and use crop rotation.

Downy mildew, caused by a fungus, has two distinct phases. The foliar phase is characterized by distinctive chlorotic spots and downy-like appearance on under leaf surface. The systemic phase is characterized by a striking chlorotic leaf stripping and sterility. Rotate with nonrelated crops. Use tolerant hybrids.

Maize dwarf mosaic gives a typical chlorotic mottle on upper leaves and a red-leaf symptom on highly susceptible sorghums. Susceptible plants are stunted and yield less if infected within 45 days after emergence. The virus overwinters in rhizomes of johnsongrass and is transmitted by insects. Control johnsongrass in and around field. Use tolerant hybrids.

Head smut, caused by a fungus, produces smut galls on the stalk and heads are sterile. Use resistant hybrids. Rotate with crop not related to sorghum.

Charcoal rot causes shredded stalk interior near ground level, poor seed development and stalk lodging. Infection by the fungus is likely when drouth stress occurs near heading. Conserve moisture and mature crop before usual drouth periods.

Anthracnose, caused by a fungus, forms circular to oval spots on leaves. Neck and stalk rots occur if the fungus penetrates the stalk. Use tolerant hybrids and crop rotation where the problem exists.

Leaf spots and *rust,* caused by several fungi and bacteria species, produce spots, stripes, pustules or streaks on leaves depending on causal organism. Use crop rotation.

Nematodes stunt the root system, resulting in poor uptake of water and nutrients. Rotate with crops which do not host the nematode involved.

Desiccants

In some situations, a desiccant to kill leaves on sorghum or grass and certain broad-leaved weeds may help dry the grain faster or reduce harvesting problems with vegetation. Desiccants presently available for grain sorghum used as feed or food usually do not kill the stalks.

Sodium chlorate plus a fire inhibitor may be applied up to 6 pounds per acre of active ingredient when the sorghum is fully mature and 7-10 days before harvest. Four pounds usually are sufficient for desiccation of sorghum and grass. Nitrogen solutions may be applied at a minimum of 30 pounds of total nitrogen per acre. Add a wetting agent. With either material, use 5-10 gallons of solution per acre for aerial applications and 20 gallons per acre for ground applications.

Harvesting

Harvest when moisture in the grain has reached a proper level for available handling facilities. Delay means losses. Acceptable moisture for storage is 13 percent. Grain with up to 18 percent moisture may be harvested if drying facilities are available.

To avoid waste, the combine operator should follow the manufacturer's manual on proper adjustment. Trash and cracked grain favor stored grain insects, moisture accumulation and mold damage. Practice good sanitation with all harvesting and storing. Protect grain from rodents and insects.

Marketing

Grain sorghum producers, individually or as a group, may: (1) forward contract a growing crop through mutually agreed upon terms of trade, then deliver the grain at harvest, fulfilling the contract; (2) "hedge" a growing crop through a "cross-hedge" using corn on the futures market, then liquidate the hedge at harvest and deliver the grain to a local buyer for cash; (3) deliver and sell a crop at harvest to a local buyer for cash; (4) store harvested crop in either on-farm or commercial storage facilities for cash sale at some later date; or, (5) place harvested crop under loan in an approved facility for later-than-harvest cash sale or by redeeming the loan and delivering title of the grain to government.

Each marketing method should be weighed by individuals or groups. Location in relation to feedlots, poultry and egg producing units, swine or sheep feeding, in addition to export demand will help determine which method is most advantageous during any marketing year.

Estimated Yield, Income, Costs and Income Over Specified Costs Per Acre

Yield—pounds per acre	**4500**
Price—per cwt	**$ 1.80**
Income—per acre[1]	**$81.00**
Preharvest costs per acre	
Seed	**$ 1.54**
Fertilizer	**9.00**
Herbicide	**2.77**
Machinery	**2.63**
Labor	**3.14**
Interest on operating capital	**.76**
Total specified preharvest costs	**$19.84**
Harvesting costs per acre	
Combining—custom	**$ 6.75**
Hauling—custom	**4.50**
Total specified harvesting costs	**$11.25**
Total specified costs	**$31.09**
Income over specified costs[2]	**$49.91**

[1]Does not include any government payments.

[2]Costs do not include unallocated overhead costs such as interest, taxes and insurance on farm real estate and machinery, depreciation on farm buildings and machinery and pickup expense.

Cultural Practices, Usual Dates, Times Over Hours Per Acre, Cost Per Hour and Cost Per Acre

Cultural practice	Usual date	Times over	Hours per Acre		Cost per Hour		Cost per Acre	
			Labor	Machinery	Labor	Machinery	Labor	Machinery
Shred stalks	**July-Aug.**	**1**	**.22**	**.2**	**$1.30**	**$1.05**	**$ .29**	**$ .21**
Plow stalks	**July-Aug.**	**1**	**.27**	**.25**	**1.30**	**1.24**	**.35**	**.31**
Bed	**Aug.-Sept.**	**1**	**.36**	**.33**	**1.30**	**1.24**	**.47**	**.41**
Fertilize	**Dec.-Jan.**	**1**	**.09**	**.08**	**1.30**	**.97**	**.12**	**.08**
Rebed	**Dec.-Jan.**	**1**	**.36**	**.33**	**1.30**	**1.24**	**.47**	**.41**
Plow beds and plant	**March**	**1**	**.37**	**.34**	**1.30**	**1.39**	**.48**	**.47**
Apply herb	**March**	**1**	**.11**	**.1**	**1.30**	**1.07**	**.14**	**.11**
Roll	**March**	**1**	**.15**	**.14**	**1.30**	**.99**	**.20**	**.14**
Cultivate	**Apr.-May**	**2**	**.48**	**.44**	**1.30**	**1.12**	**.62**	**.49**
Harvest	**July-Aug.**	**1**	**Custom**					
Total			**2.41**	**2.21**			**$3.14**	**$2.63**

More detailed information on grain sorghum production is available at the county Extension offices.

Cooperative Extension Work in Agriculture and Home Economics, Texas A&M University and the United States Department of Agriculture cooperating. Distributed in futherance of the Acts of Congress of May 8, 1914, as amended, and June 30, 1914.
50M—1-70 AGR 12-2